

DRAWINGS:

The last O.A. objected to the following figures on the grounds that they included reference characters not mentioned in the specification:

- Figure 5: Reference characters 36, 37, and 38.
- Figure 10: Reference characters 39, 46, 90, 91, 92, 94, 97, 98, 99, and 100
- Figure 12: Reference characters 101, 107, 108, 109, and 113

The Figures 5, 10, and 12 have been revised to omit the unmentioned reference characters.

Replacement sheets 3/9, 7/9, 9/9 are attached in Appendix 2 containing the revised drawings.

REMARKS – General

This is in response to the Office Action dated 12/10/2007. A petition for an extension of time (three months) and the required fee are attached. Also attached is a Change of Correspondence Address application, directing such correspondence to the Applicant Pro Se.

Said O.A. contained six (6) numbered actions:

- (1) An objection to the drawings for containing reference characters not mentioned in the specification. The drawings have been amended, and replacement sheets are attached.
- (2) An objection to an informality of the specification (p. 12), i.e. reference character being given as '136' instead of '36'. The specification has been amended to recite '36'.
- (3) An objection to claims 14 and 22 for failing to further limit the subject matter of a previous claim. The specification has been amended to define more-specific terms, and these dependent claims rewritten to use said more-specific terms to recite subject matter not recited in their respective independent claims, as discussed in detail in the Remarks below.
- (4) A recitation of §103 regarding obviousness.
- (5) Rejection of Claims 11-18 and 20-25 under §103 as being obvious. The specification has been amended and the claims re-written to define patentably, as discussed in the Remarks below.
- (6) Rejection of Claim 19 under §103 as being obvious. Claim 19 has been cancelled.

By this Amendment, Applicant has

- amended the Title to recite "A Portable Polyphonic Button-Field Musical Controller with Thumb-Controlled Expressive Effects" rather than "A Musical Instrument" to emphasize the novelty of the invention;
- rewritten the Summary of the Invention to emphasize the novelty of the invention;
- rewritten the Abstract to emphasize the novelty of the invention;
- amended the Drawings as requested by the O.A.;
- defined the concepts introduced in the specification using more-specific terms, and revised the specification to use these terms consistently, to describe the invention more particularly and distinctly; and
- rewritten all claims to recite the invention more particularly and distinctly so as to overcome the rejections and define the invention patentably over the prior art.

Rejection of Claim 11 under §103 over Suzuki

The last O.A. rejected independent Claim 11 under §103 as being obvious over Suzuki. Claim 11 has been rewritten as new Claim 26 to define patentably over Suzuki, Galocy, and any combination thereof.

The language of Claim 26 distinguishes over Suzuki under §102 because Suzuki does not show:

- Any note-identifier buttons, as defined in the amended specification to mean “a button that corresponds to a predetermined note;” Suzuki requires the actuation of multiple buttons and/or arm positions to identify a single note.
- Any button-fields, as defined in the amended specification to mean “a bounded substantially two-dimensional array of at least five note-identifier buttons;” Suzuki has five finger-actuated buttons, but they are not note-identifiers, and they are arranged in three dimensions, not two.
- A physical means of enabling the performer to specify more than one note at a time (i.e., polyphony); Suzuki’s controller is monophonic.

These physical distinctions are submitted to be non-obvious under §103 for reasons discussed individually below.

Mapping Musical Effects to the Thumbs Would Reduce Suzuki’s Expressiveness and Functionality

The last O.A. stated (p. 4) that it would be obvious “to modify the music controller disclosed by Suzuki et al. with thumb actuated effect identifier input devices. This would require only a programming modification in which different buttons and devices produce different sounds and effects. Doing this would provide greater versatility and variation in the use of said music controller.”

Applicant submits that a careful examination of the consequences of such a program modification – i.e., a function-to-button re-mapping – reveals that such a re-mapping would actually produce LESS versatility and variation than Suzuki’s presented mapping, not more.

In Suzuki’s invention, the thumbs and index fingers each control two buttons, whereas the middle, ring, and pinky fingers each control a single button. Hence Suzuki’s invention provides “dual-button” digits (the thumbs and index fingers) and “single-button digits” (the middle, ring, and pinky fingers).

Suzuki maps “either/or” variables to the dual-button digits’ buttons. For example, in Suzuki, the monophonic note being sounded can come from only one of four octaves; Suzuki maps this “either/or” octave-selection to two dual-button digits (the left thumb and index finger), thereby minimizing the number of digits devoted to octave-selection. Likewise, a monophonic note can be either sharp or flat, but not both; Suzuki maps sharp-or-flat-ness to a single dual-button digit, thereby minimizing the number of digits devoted to sharp-or-flat-ness.

Suzuki maps expressive variables – wow, vibrato, and volume – to single-button digits. This enables these three musical effects to be independently controlled.

Pressing both of a dual-button digit’s buttons simultaneously, but with different levels of force on each button, and varying those different force levels independently in a musically-expressive manner, would be nearly impossible, and Suzuki does not even suggest it. Suzuki’s mapping of “either/or” variables to the dual-button digits’ buttons suggests that no such simultaneous, independent control of dual button pressure is envisioned. It is reasonable to suggest, therefore, that if musical effects such as volume,

vibrato, wow, etc. were to be mapped to a dual-button digits' buttons, then only one of these buttons would be actuated at a time. Thus although four musical effects could be mapped to the two thumbs' dual buttons, each thumb could only control one musical effect at a time, whereas Suzuki's mapping enables three musical effects to be controlled at the same time. The re-mapping would result in a 33% reduction in the number of simultaneously-controllable musical effects. Hence, re-mapping Suzuki's musical effects to the thumbs, as proposed by the last O.A., would decrease Suzuki's expressive power, not increase it.

Furthermore, re-mapping the musical effects (and only musical effects) to the thumbs of Suzuki's invention would displace the four functions (two octave-choice and two note-actuation) that Suzuki maps to the thumbs – but only three functions would be shifted from the fingers to the thumbs (i.e., the musical effects: volume, vibrato, and wow). To accommodate the extra function formerly controlled by the thumb, some function that Suzuki maps to the fingers would have to be sacrificed – perhaps one of the tone colors (sax, flute, or piano), or the fourth octave (which Suzuki maps to one of the left index finger's two buttons). No matter which function is sacrificed, it is nonetheless clear that re-mapping the musical effects to the thumbs of Suzuki's invention forces a net LOSS in functionality, not an increase.

Applicant submits that re-mapping expressive effects to at least one thumb would actually decrease the versatility and variation power of Suzuki's invention, rather than increase it as suggested by the last O.A.. Applicant submits that because of this, Suzuki teaches AGAINST the present inventions' thumb-operated expressive controls, making the present invention non-obvious over Suzuki.

Suzuki Does Not Suggest or Motivate Controlling Musical Effects with the Thumbs

Suzuki's Figs 12 and 13 show its function-to-button mapping, which maps its expressive effects to the fingers, not the thumbs. No alternative mapping is presented, nor any discussion of there being an alternative mapping. Suzuki lacks any suggestion or motivation that musical effects should be controlled by at least one thumb, which is not surprising, as such a mapping would (as shown above) decrease Suzuki's versatility and variation.

The Present Invention Solves a Different Problem than Suzuki

Suzuki's invention tackled the problem of adding expression to a monophonic controller, not a polyphonic controller, and his solution is not applicable to polyphonic controllers. Suzuki requires that the middle and ring fingers remain fixed in place so that they can support the controller via a stud held between them (see the studs labeled 6L and 6R in Suzuki's Figs 2 & 3, respectively). These two fingers, having to remain fixed in position, are not available to move freely over the surface of a button-field, making them unavailable to control any more than one note-identifier button. Furthermore, fixing these two central fingers in place restricts the movement of the outer two fingers. These limitations on finger-movement severely limit Suzuki's potential as a polyphonic controller.

Applicant submits that the dedication of at least one thumb to the control of musical effects in a polyphonic controller solves a different problem than Suzuki, and is therefore non-obvious over Suzuki.

Dynamic Tonality is an Unexpected Benefit of the Present Invention

The present invention's combination of thumb-operated expressive controls and a finger-actuated button-field has led to the discovery of a previously-unknown suite of musical effects which are collectively called Dynamic Tonality.¹ Dynamic Tonality requires at least one continuous controller (to control tuning) that can be adjusted in real-time while playing polyphonically, and a special kind of button-field (an isomorphic keyboard²).

Dynamic Tonality cannot be achieved using Suzuki, even if Suzuki's expressive variables were mapped to its thumb controls, because Suzuki is not polyphonic and does not comprise a button-field.

Applicant submits that the ability of the present invention to control Dynamic Tonality is an unexpected benefit over Suzuki, making the present invention non-obvious over Suzuki.

The Use of the Thumbs to Control Musical Effects is Contrary to the Teachings of the Prior Art

Performance practice on the piano-style keyboard, established over centuries, devotes all of the player's digits to note-actuation and the control of note-actuation variables (as defined in the amended specification to mean "a variable that is controlled by the physical actuation of a note-identifying button, such as key velocity, polyphonic aftertouch, or channel pressure").

This established practice of devoting all available digits to note-actuation is followed in large button-field controllers, such as that of Wesley (US 6,501,011), who states (starting at column 18, line 13) that:

"The use of the thumbs is very important in playing the Sensor Array...When a note combination is played which approximates the tuning of a harmonic or of a subharmonic series it is the thumb which usually plays the pivotal note that approximates the fundamental frequency of the series."

Hand-held button-field instruments, such as the concertina, similarly devote all available digits to note-actuation; the only difference is that on these hand-held instruments, the thumbs are unavailable to select notes, being instead devoted to supporting the instrument.

Further evidence supporting the establishment of the practice of devoting all available digits to note-actuation is the performance practice of the English concertina. It was designed to be supported by the thumb and stabilized by the pinky, with only the middle three fingers devoted to note-actuation (see Fig 1 in Wheatstone GB 10,041).³ Yet virtuoso players of this instrument, such as Giulio Regondi,⁴ were noted for their use of all four fingers in note-actuation.

¹ http://en.wikipedia.org/wiki/Dynamic_tonality

² http://en.wikipedia.org/wiki/Isomorphic_keyboard

³ <http://www.concertina.com/wheatstone/Wheatstone-Concertina-Patent-No-10041-of-1844.pdf>

⁴ http://en.wikipedia.org/wiki/Giulio_Regondi

Therefore, if a breakthrough in concertina design were to free its players' thumbs from the duty of supporting the instrument, established performance practice would make it obvious to devote the freed-up thumbs to note-actuation, not to the control of per-field effects as claimed in the present invention.

Applicant submits that the dedication of at least one of the player's thumbs to the control of per-field effects is contrary to the teachings of the prior art, and is therefore non-obvious.

The Present Invention Offers the Unappreciated Advantage of Progressive Complexity

Placing per-field expressive effects under the control of the thumbs enables novices to learn "to hit the right notes at the right times" first with note-actuation variables disabled, then with note-actuation variables enabled, then with one thumb-controlled effect enabled, then with another thumb-controlled effect enabled, and so on. Such "progressive complexity" enables students to focus on one new aspect of the controller at a time, increasing its potential ease-of-learning.

The advantage of progressive complexity is under-appreciated, because the instruments traditionally used in music education preclude the possibility of progressive complexity. For example, monophonic instruments such as the clarinet, trumpet, violin, etc. use the same means (breath or bow) to urge note actuation and expressive control, which precludes the possibility of progressive complexity. Electronic piano-style keyboards can offer at most two steps in progressive complexity – first enabling key velocity, then enabling polyphonic aftertouch – but established music education practice embraces key velocity from the outset, without ever reaching polyphonic aftertouch (which is rare even among high-end keyboard synthesizers).

In addition to offering more steps of progressive complexity, the present invention also makes these steps more independent of each other, by placing note-actuation under the control of the fingers, with the control of per-field effects primarily under the control of the thumbs.

Applicant submits that progressive complexity is an unappreciated advantage of the present invention, which is therefore non-obvious.

The Present Invention has Received Awards and Professional Recognition for its Innovativeness

The present invention won a competitive Australian federal government R&D grant in the amount of AU\$355,659 and the 2006 Western Australian Information Technology and Telecommunications Association's Award for Innovation⁵ (having been developed initially in Western Australia); it was a Finalist in the Austin Business Journal's 2007 Tech Innovation Awards (having had its development

⁵ http://www.sciencewa.net.au/index.php?option=com_content&task=view&id=875&Itemid=587

continued in Austin);⁶ and it has been featured on the cover of MIT's peer-reviewed Computer Music Journal (see attached Appendix 1).⁷

In addition, independent experts in the field have praised the present invention, including:

- Dr. Garth Paine,⁸ co-founder of the annual international academic conference "New Interfaces for Musical Expression,"⁹ who wrote¹⁰ that an embodiment of present invention "has the potential to be among the most expressive – and perhaps the single most expressive – polyphonic musical interface in electronic music;"
- Dr. Camille Goudeseune,¹¹ an academic researcher in human-computer interactions,¹² who wrote¹³ that the present invention's "combination of many degrees of freedom with a hand-held keyboard instrument is groundbreaking. I have never before seen an instrument with the expressive potential of [the present invention], despite extensive academic research in this field;" and
- Roger Linn,¹⁴ one of the world's most influential designers of new musical interfaces, who wrote¹⁵ that "the universal use of the [piano-style] keyboard controller interface has limited the expressive potential of electronic music. To unleash its potential, we need new music interfaces that combine the polyphony of the piano keyboard, the fine solo expressivity of the guitar, violin or woodwinds, and are easy to learn. I think [the present invention] takes a big step in that direction."

Claim 11: Request for Reconsideration and Allowance

For all of the above reasons, Applicant submits that Claim 11, now re-written as new independent Claim 26 – is allowable over the cited references, and solicits its reconsideration and allowance.

Claim 18: Request for Reconsideration and Allowance

Applicant further submits that for all of the same reasons, independent Claim 18 – now rewritten as new independent Claim 32 – is also allowable over the cited references, and solicits its reconsideration and allowance.

⁶ <http://www.bizjournals.com/austin/stories/2007/09/17/story04.html>

⁷ <http://www.mitpressjournals.org/doi/pdf/10.1162/comj.2007.31.4.15>

⁸ <http://marcs.uws.edu.au/people/paine/>

⁹ <http://www.nime.org/>

¹⁰ <http://www.thummer.com/los/paine.pdf>

¹¹ <http://zx81.isl.uiuc.edu/camilleg/>

¹² <http://isl.uiuc.edu>

¹³ <http://www.thummer.com/los/goudeseune.pdf>

¹⁴ <http://www.rogerlinndesign.com/other/about.shtml>

¹⁵ <http://www.thummer.com/reviews.asp>

Claims 12 and 20: Suzuki's Thumb-Buttons Are Not Multi-Variate

The last O.A. rejected dependent Claims 12 and 20, which additionally recited, "wherein at least one said thumb actuated per-field effect value input device is multi-variate," under §103 as being obvious over Suzuki, noting (p.4) that "Suzuki et al. discloses a music controller as stated above where the magnitude of effects such as vibrato are multi-variate, or can be varied."

Applicant apologizes for contributing to this ambiguity by using the term "multi-value" in the previous version of the specification while using the term "multi-variate" in its claims. The amended version of the specification now uses the term "multi-variate," matching the claims.

The word "multi-variate" is defined as:

- Merriam-Webster:¹⁶ Having or involving a number of independent mathematical or statistical variables.
- American Heritage:¹⁷ Having or involving more than one variable.
- Encarta:¹⁸ Involving several statistical variables.

This common definition of "multi-variate" – i.e., "having more than one independent variable" – is the definition Applicant intends. If the common definition of "multi-variate" is not the one used by the USPTO, then Applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the Applicant can reword this Claim accordingly.

Claims 12 and 20 have been rewritten as new dependent Claims 27 and 33 respectively, to incorporate all of the subject matter of independent Claims 26 and 32 respectively, making them a fortiori patentable over Suzuki, Galocy, and any possible combinations thereof.

Both Claim 27 and Claim 33 additionally recite:

"wherein at least one said thumb actuated per-field effect value input device is multi-variate."

Each of Suzuki's thumb-operated buttons is uni-variate, i.e. controls the value of a single variable. The pair of buttons Suzuki places beneath a single thumb cannot be considered to comprise a single multi-variate control, as it would be nearly impossible to control both buttons simultaneously yet independently with a single thumb.

Examples of multi-variate controls could include (without limitation) analog sticks, joysticks, touch-pads, or 2D proximity sensors, each of which enables the simultaneous independent control of a plurality of variables. The use of such thumb-actuated multi-variate controllers is clearly foreign to Suzuki.

¹⁶ <http://www.merriam-webster.com/dictionary/multivariate>

¹⁷ <http://www.bartleby.com/61/7/M0480750.html>

¹⁸ http://encarta.msn.com/dictionary_1861631883/multivariate.html

Claims 13 and 21: Suzuki Does Not Disclose a Music Controller “As Stated Above”

The last O.A. rejected dependent Claims 13 and 21 under §103 as being obvious over Suzuki, noting (p.5) that “Suzuki et al. discloses a music controller as stated above...”. However, it has been shown above in these Remarks that new independent Claims 26 and 32 are patentably novel and non-obvious over Suzuki. Claims 13 and 21 have been rewritten as new dependent Claims 28 and 34, respectively, to incorporate all of the subject matter of Claim 26 and 32, respectively, making them a fortiori patentable over Suzuki, Galocy, and any possible combinations thereof. In addition, they have been rewritten to recite the amended specification’s more-specific term “per-field” effects, rather than the more-general “musical effect,” and have been updated to recite “at least five finger actuated note identifier input buttons” rather than the three such buttons recited by the previous versions.

Dependent Claims 14 and 22 were objected to in the last O.A. as being of improper dependent form for “failing to limit the subject matter of previous claim.” Claims 14 and 22 have been rewritten as new dependent Claims 29 and 35 respectively, to incorporate all of the subject matter of Claim 26 and Claim 32 respectively, making them a fortiori patentable over Suzuki, Galocy, and any possible combinations thereof. In addition, new Claims 29 and 35 use the more-specific term “note-actuation variables,” defined in the amended specification to mean “a variable that is controlled by the physical actuation of a note-identifying button, such as key velocity, polyphonic aftertouch, or channel pressure,” rather than the more-general term “musical effects” as in the original claims. Claim 29 also recites “said at least five finger actuated note identifier input buttons,” rather than the previous three. Applicant submits that use of these more-specific terms makes Claims 29 and 35 allowable. New Claim 29 absorbs the content of Claim 15, which is cancelled. New Claim 35 absorbs the content of Claim 23, which is cancelled.

Dependent Claim 15 is cancelled.

Dependent Claim 23 is cancelled.

Dependent Claims 16 and 24 have been rewritten as new dependent Claims 30 and 36, respectively, to incorporate all of the subject matter of Claim 26 (via Claim 29) and Claim 32 (via Claim 35), respectively, which makes them a fortiori patentable over Suzuki, Galocy, and any possible combinations thereof. In addition, they recite the amended specification’s more-specific term “note-actuation variable,” rather than the more-general “musical effect.”

Dependent Claims 17 and 25 have been rewritten as new dependent Claims 31 and 37, respectively, to incorporate all of the subject matter of Claim 26 and Claim 32, respectively, making them a fortiori patentable over Suzuki, Galocy, and any possible combinations thereof.

In addition,

- the recitation of “a button” is omitted, and
- they recite the amended specification’s more-specific term “thumb actuated per-field effect” rather than the more-general “thumb actuated effect,” to clarify the application of said effect.

Independent Claim 18 has been rewritten as Claim 32. Please see "Claim 32: Request for Reconsideration and Allowance" above.

Dependent Claim 19 is cancelled.

CONCLUSION

For all of the above reasons, Applicant submits that the specification and claims are now in proper form, and that the claims all define patentably over the prior art. Therefore, Applicant submits that this application is now in condition for allowance, which action Applicant respectfully solicits.

Conditional Request for Constructive Assistance

Applicant has amended the specification and claims of this application so that they are now proper, definite, and define novel structure which is also non-obvious. If, for any reason this application is not believed to be in full condition for allowance, Applicant respectfully requests the constructive assistance and suggestions of the Examiner pursuant to M.P.E.P. § 2173.02 and § 707.07(j) in order that the Applicant can place this application in allowable condition as soon as possible without the need for further proceedings.

No New Matter

The undersigned hereby certifies that the document appended herewith, Substitute Specification (Clean Copy), contains no new matter, and that the similarly appended Substitute Specification (Changes Marked) accurately reflects the difference between said Substitute Specification(Clean Copy) and the immediately-prior version of this Application's Specification.

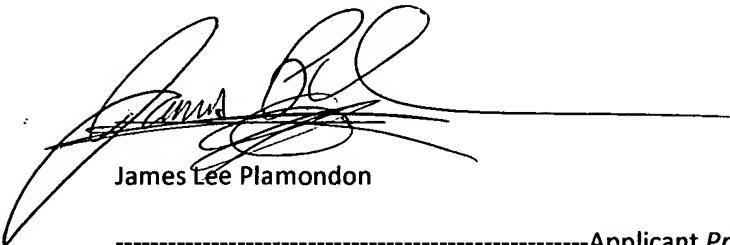
Pro Se & Small Entity

Financial constraints have required that Applicant dispense with the services of any patent attorneys. Applicant now represents himself (relying heavily on Pressman's "Patent It Yourself," 13th Edition).

Small Entity

The undersigned hereby asserts as Inventor that he is a Small Entity, and further asserts as sole Director of Thumtronics (Assignee) that Thumtronics is a Small Entity, both as described in M.P.E.P. § 1.27(a).

Very Respectfully,



James Lee Plamondon

-----Applicant Pro Se-----

Enc:

- See "Appendices," below

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9th June 2008

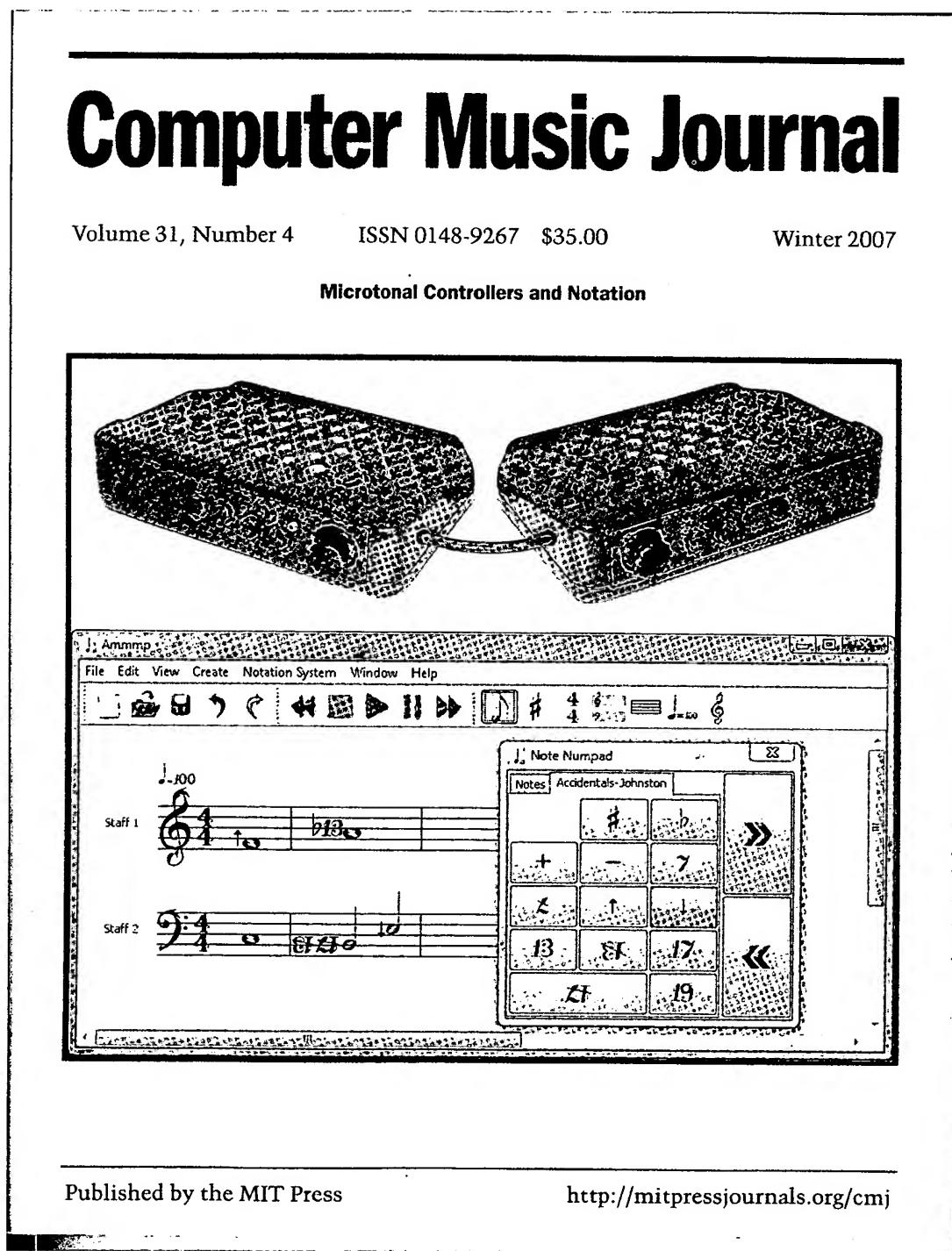


APPENDICES

- (1) Computer Music Journal, Winter 2007, Cover
- (2) Drawings: Replacement Sheets 3/9, 7/9, and 9/9.
- (3) Substitute Specification
 - a. Clean Copy
 - b. Changes Marked
- (4) Petition for the Extension of Time (3 Months), with Fee (\$525)
- (5) Change of Correspondence Address Application

APPENDIX (1)

Cover of the Winter 2007 Issue of MIT's Computer Music Journal, featuring an embodiment of the present invention.



APPENDIX (2)

Replacement Sheets 3/9, 7/9, and 9/9